Seeing in a Different Light

Using Landsat to solve Earth's problems

Move the puck to any of the orange circles on the map.

Gary's Beet Farm, Minnesota, USA

Beets grow the sweetest in fields where they absorb lots of nitrogen from the soil. Use Landsat imagery to help Gary find out where his beets will be the sweetest.

Press button to continue.

Compare these two images.

Image 1: Gary's beet farm, like we see it
This image of Gary's farm looks like what we would see from space. The fields appear green because of the green plants growing there.

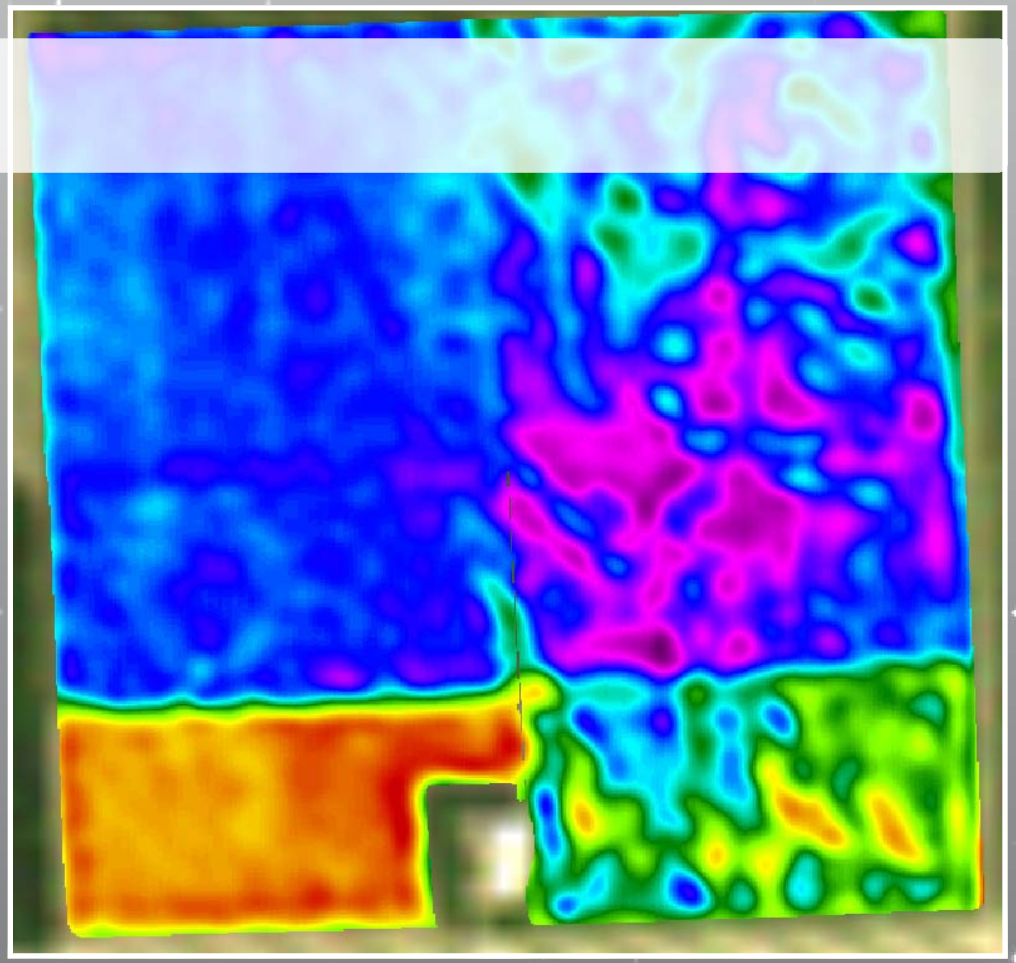
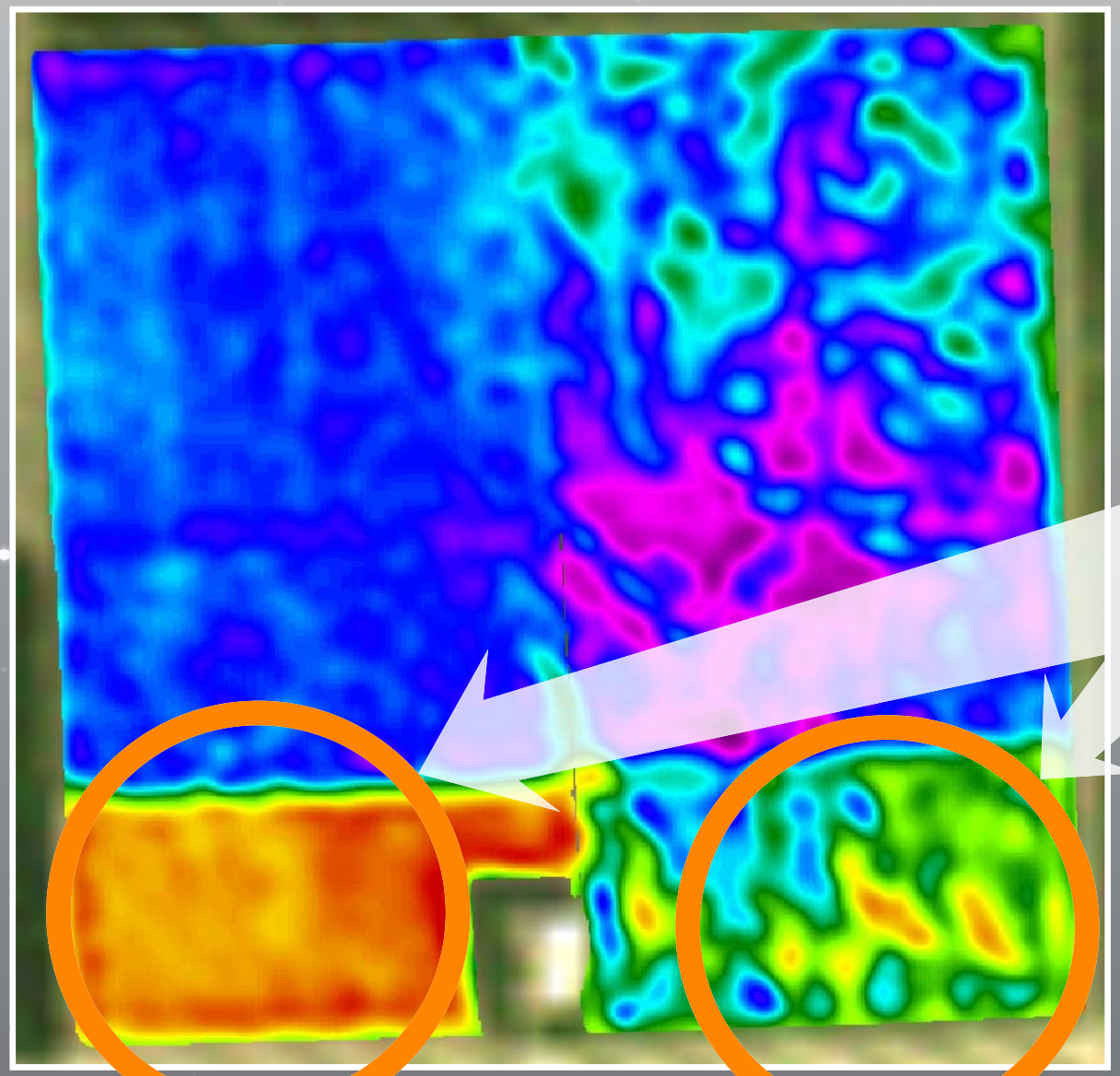


Image 2: Gary's beet farm, in infrared
Landsat measures reflected infrared light to "see" where beets are absorbing the most nitrogen. Fields where plants absorbed a lot look yellow. Fields where they did not look magenta.

If Gary was looking at these images, where would he go to find the sweetest beets in his field?

Press button to continue.



This infrared Landsat image will help Gary the most. **He can tell that the beets in the areas that look yellow are the sweetest!**

Select another location on the map below.

photo by flickr user Tom Olliver

Urbanization and City Planning, Dubai, United Arab Emirates

Dubai is a tourist destination where visitors go to enjoy resorts with beautiful beaches. Use Landsat images to see the change in coastline over time, and to help city planners find ways to build more beachfront property.

Press button to continue.

Compare these two images.

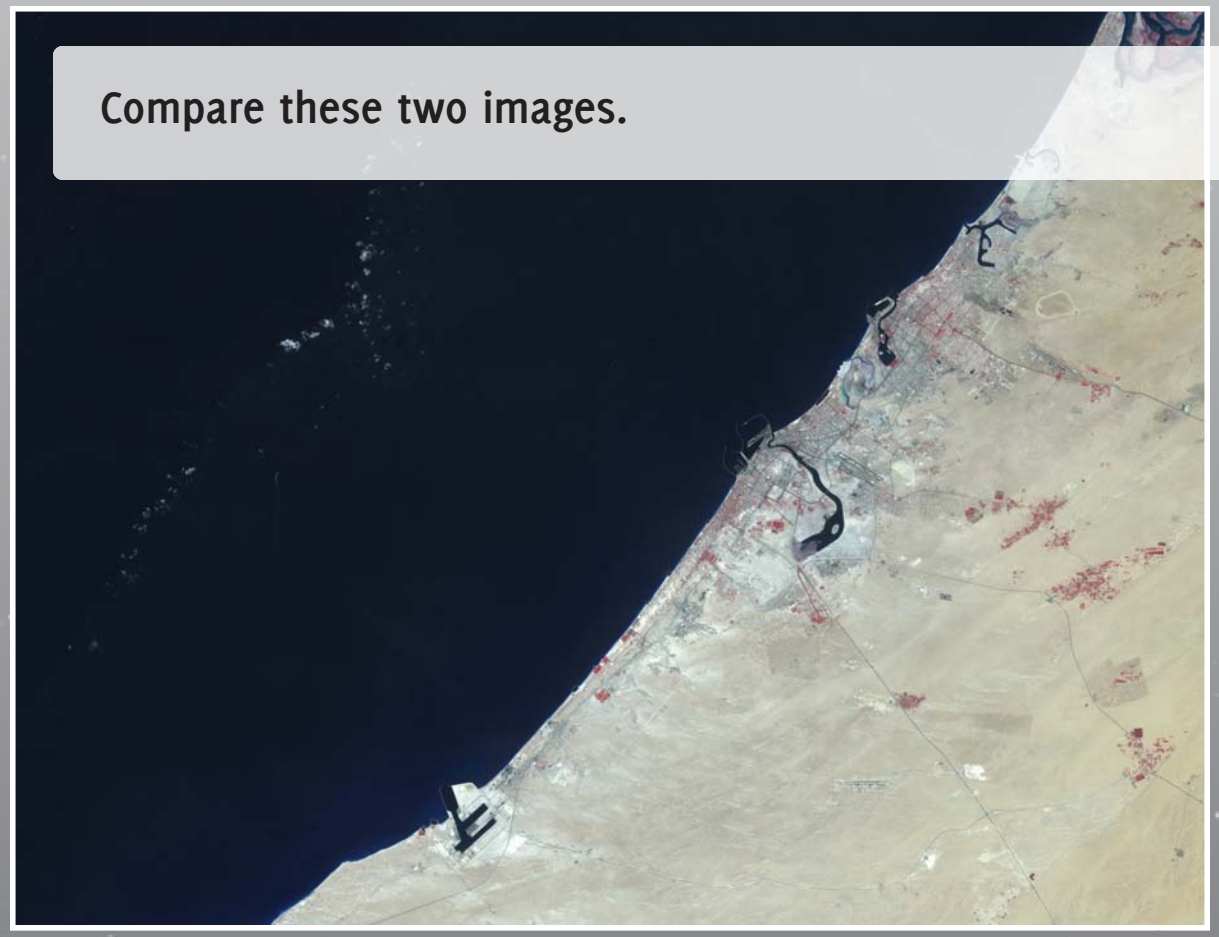


Image 1: Dubai Coastline, 1990
This Landsat image shows Dubai in 1990 in near infrared light. Streets and buildings were already built along the entire waterfront.

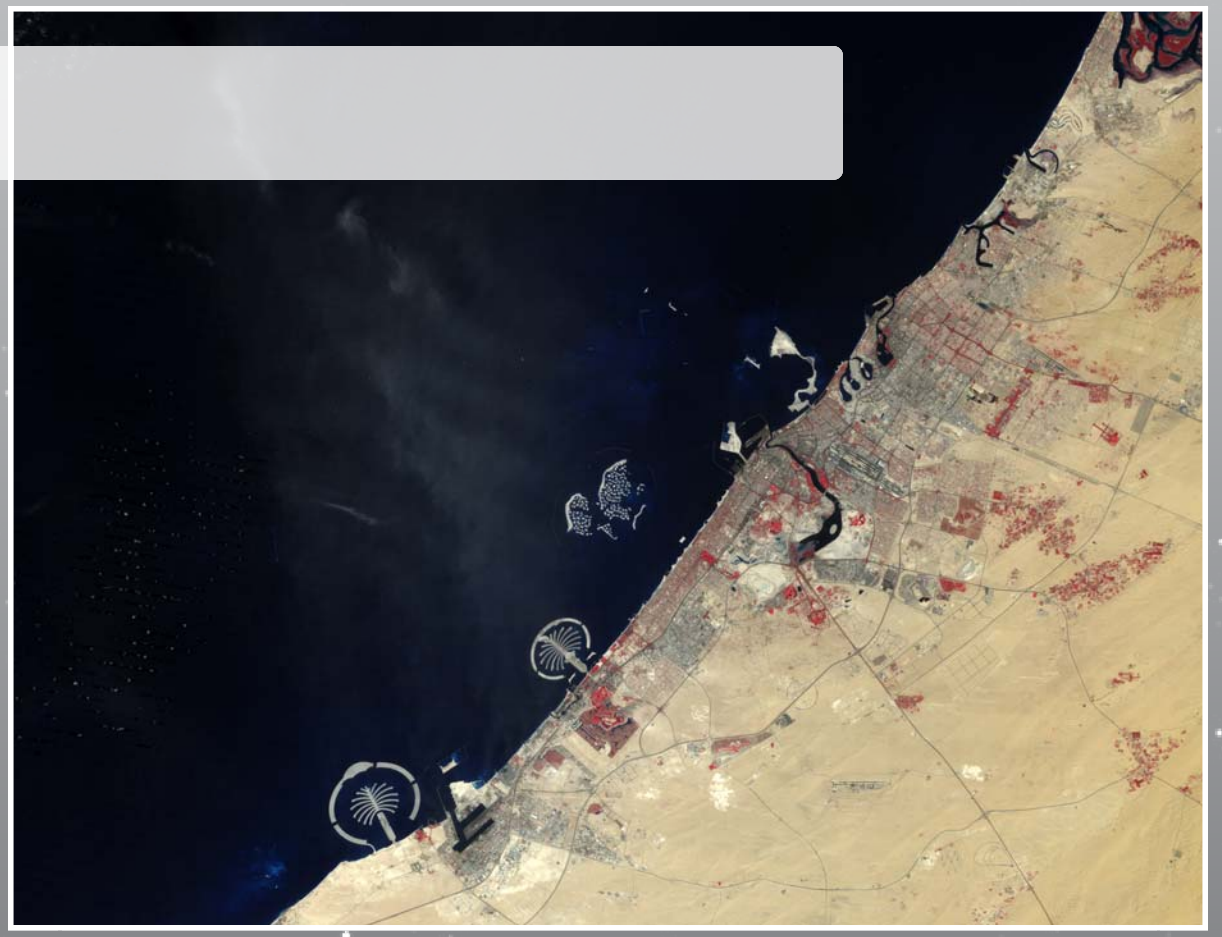


Image 2: Dubai Coastline, 2006
This Landsat image shows the change to Dubai's coastline in 2006, after developers built man-made islands from sand dredged up from the Persian Gulf floor. The engineers built some of these islands in the shape of palm trees!

Why do you think the engineers chose this shape for their man-made islands?

Press button to continue.

The palm tree shape lets developers place hotels and resorts right up against the beach, and that makes it more fun for tourists. Landsat images can help city planners come up with creative ideas on how to use space in a city.

Select another location on the map below.

Monitoring Fire Severity, Victoria, Australia

Landsat images are used to determine the amount of land burned during a forest fire, and how severe the fire was. Use Landsat images to identify the areas that suffered the most and may need help recovering.

Press button to continue.

Compare these two images.

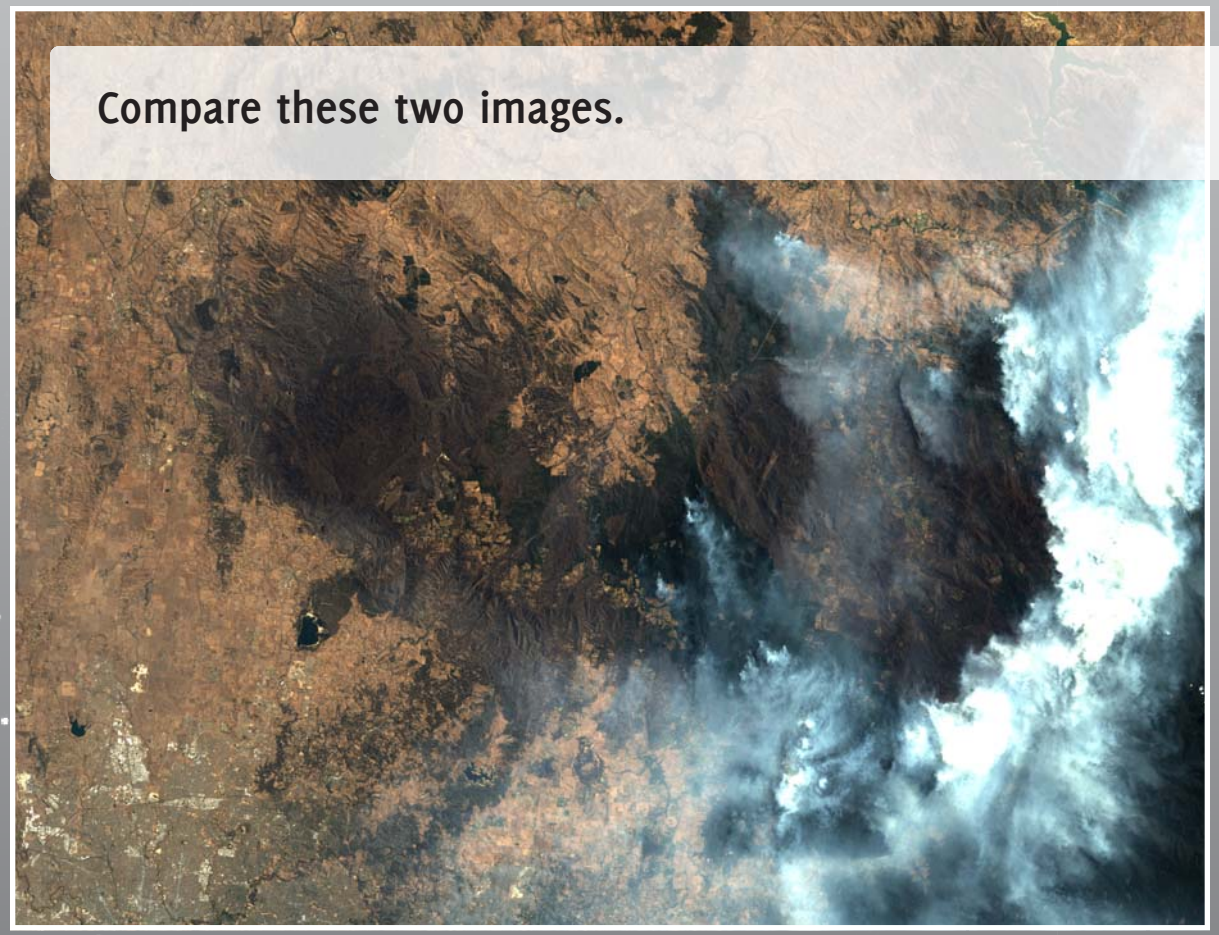


Image 1: Burned forest, how our eyes see it
Forest fires scorched the Yarra Mountain Range near Melbourne, Australia. Burned areas are a black smudge against the brown landscape in this Landsat image. The smoke from the fire is bright white. In the bottom left corner, Melbourne's suburbs look greyish brown.

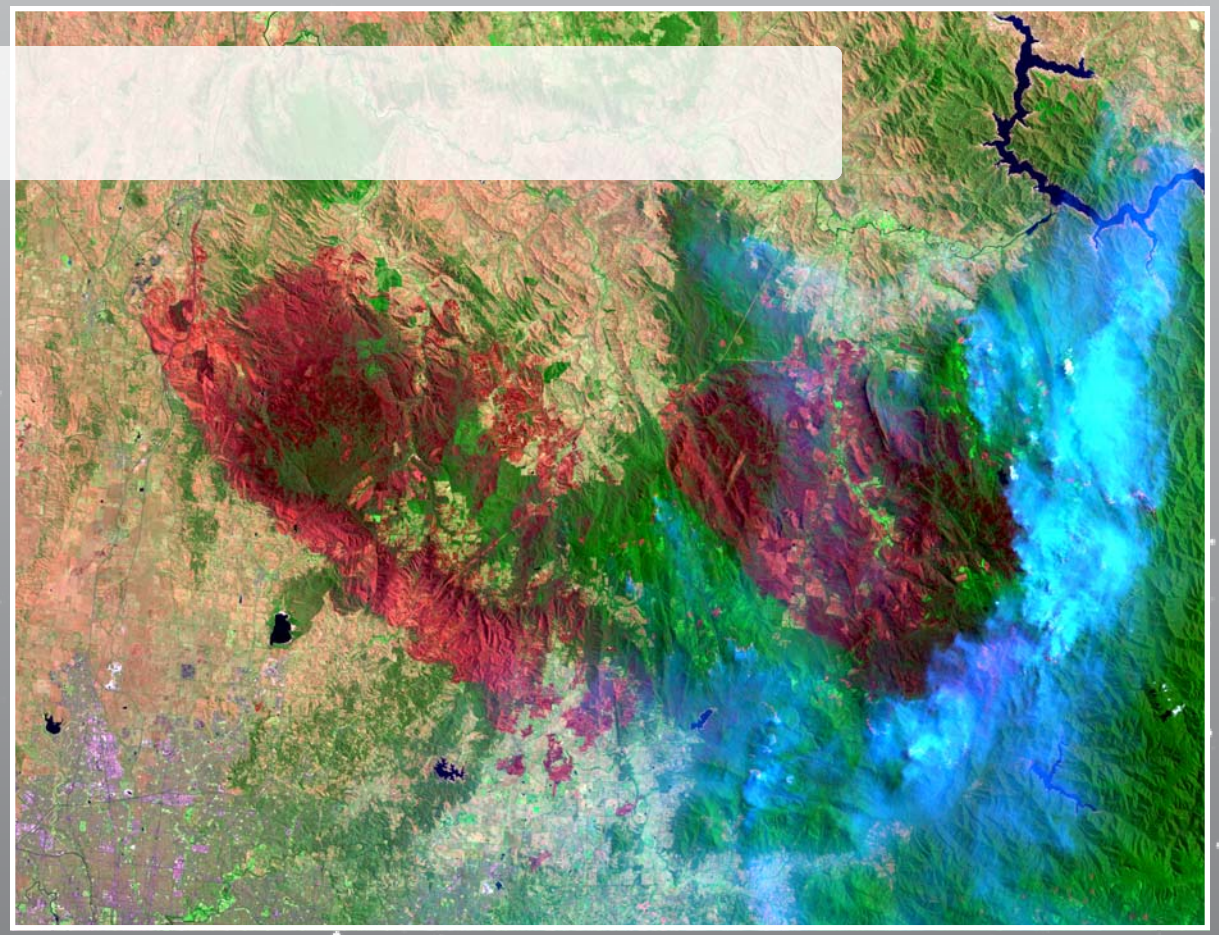
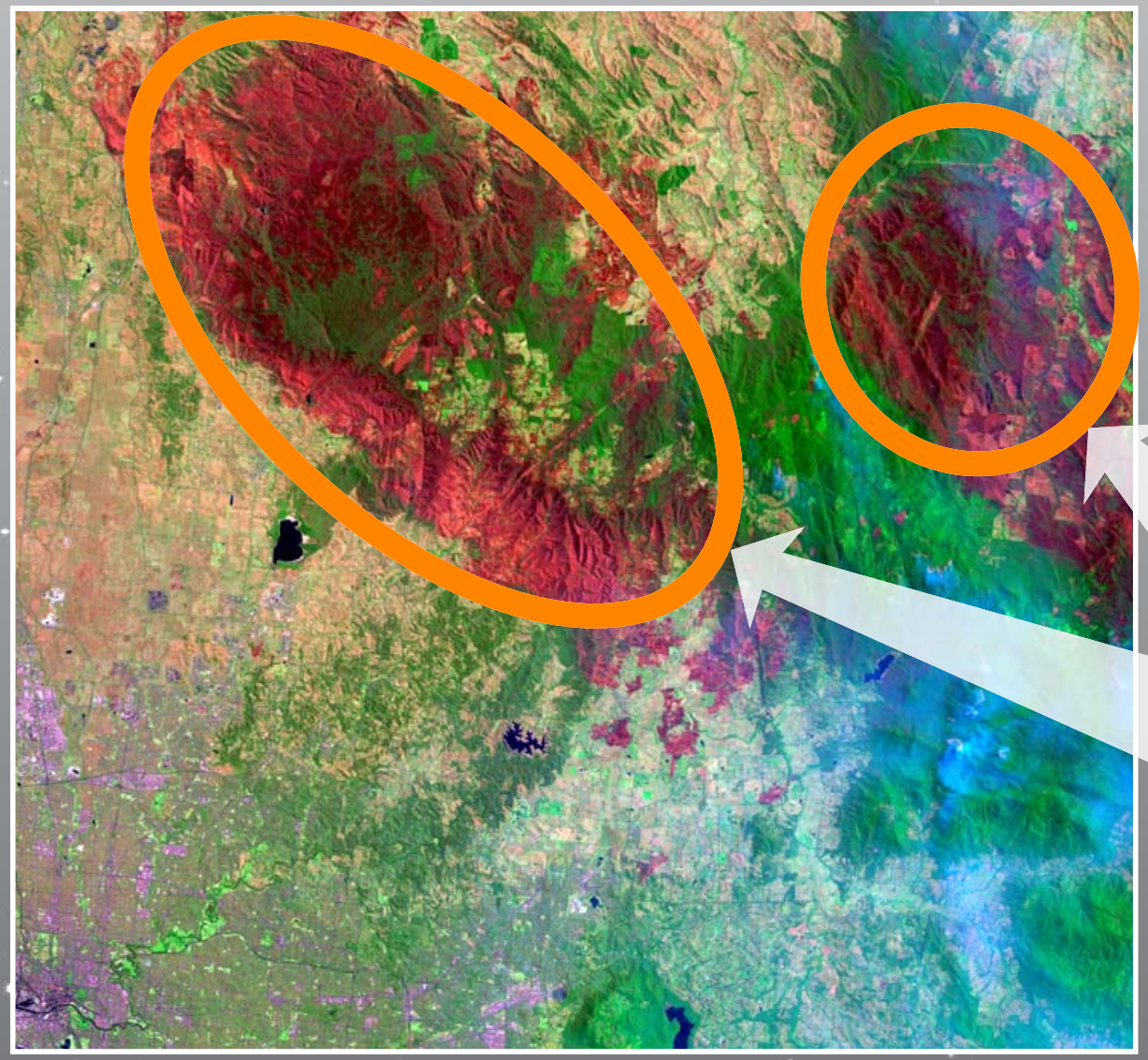


Image 2: Burned forest, in shortwave infrared
In this Landsat image, infrared light "sees" the fire differently. The burned area is a deep red, and the unaffected forest is green and brown. The smoke is light blue, and the suburbs look light purple.

If you were an Australian forester, which areas would you measure to learn how much land was burned?

Press button to continue.



The red burned areas on the infrared Landsat image make it easy for land managers to see the boundaries of the burned forest. They can measure how much land was burned and identify what areas may need help recovering.

Select another location on the map below.

Deforestation in the Rainforest, Brazil

Rainforests are home to countless species of animals, plants, and fungi. Deforestation has lead to habitat loss, and habitats at the edge of the forest are also extremely impacted. Use satellite images to help ecologists find intact areas of forest that can be preserved.

Press button to continue.

Compare these two images.

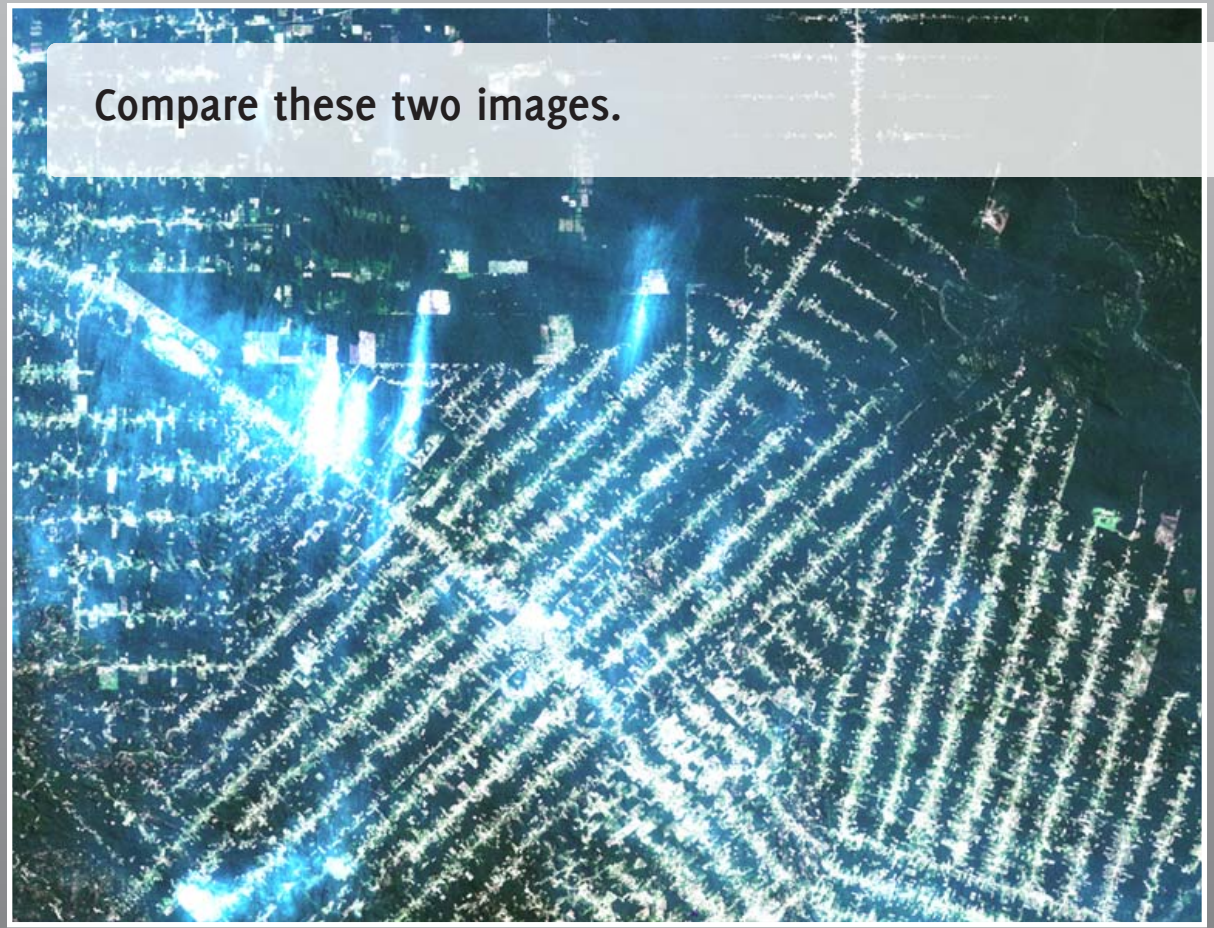


Image 1: Rondônia, Brazil, 1986
This Landsat image of the Amazon rainforest looks like what we would see from space. The off-white "fishbone" pattern shows where the forest has been removed. Clouds are fuzzy and white.

Image 2: Rondônia, Brazil, 2008
Twenty-two years later, Landsat images of the same area show how much the deforestation is spreading. The forest is dark green, and the deforested areas appear off-white.

If you were an ecologist, which area would you preserve in order to protect endangered species?

Press button to continue.

Most ecologists would recommend preserving the largest intact area of forest that has the least amount of edge environment. Protecting habitat is an important step toward preserving the amazing species that live in the rainforest.

Select another location on the map below.

Volcanic Eruption, Mount Etna, Sicily, Italy

Mount Etna is one of the most active volcanoes on Earth with eruptions that can last for months or years. Emergency workers need to plan so that when an eruption starts, they know how to keep people safe. Landsat images can show where lava flowed during each eruption.

Press button to continue.

Compare these two images.

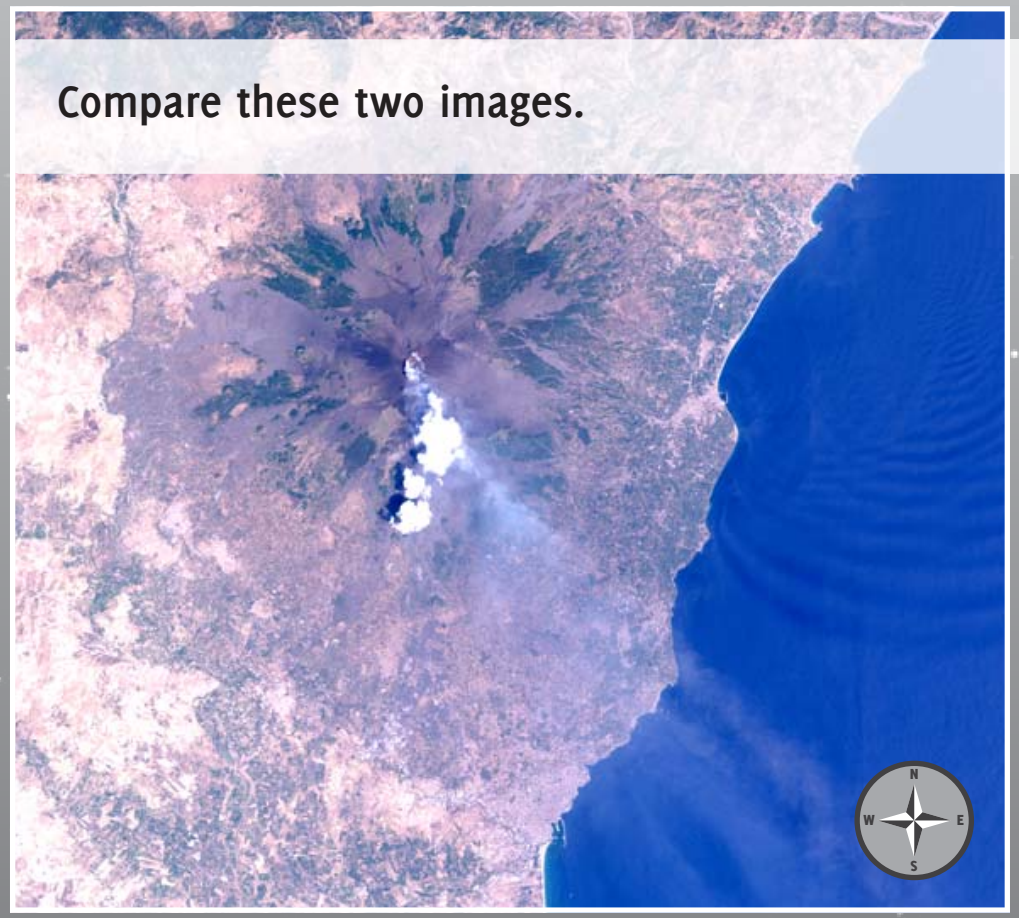
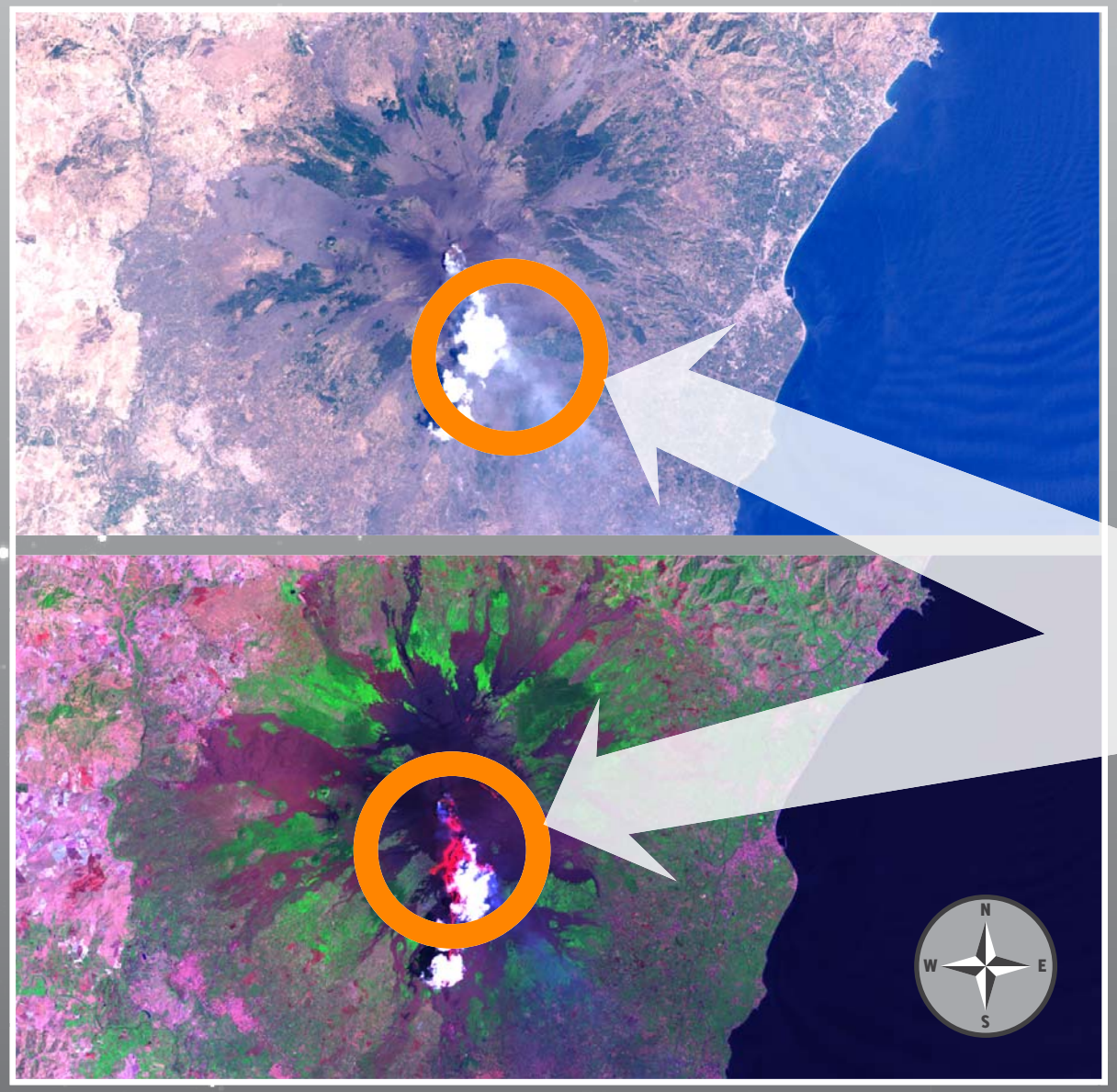


Image 1: Mount Etna, like we see it
In this Landsat image, volcanic gas looks like big white plumes, and the ash looks like white, wispy clouds. Plants and trees are dark green, and bare ground is tan.

Image 2: Mount Etna, in shortwave infrared
This Landsat image includes both infrared and visible light. Infrared light shows heat, which means that you can see hot lava cascading down the volcano. The lava is red, the plants and trees are bright green, and the bare ground is purple.

If you were in charge of keeping people safe around the volcano, which areas would you evacuate?

Press button to continue.



Looking at the volcano in visible light only shows that the ash was blowing southeast. The image made with shortwave infrared light shows that people should also avoid the south side of the volcano, to avoid the fresh lava during this eruption.

Select another location on the map below.

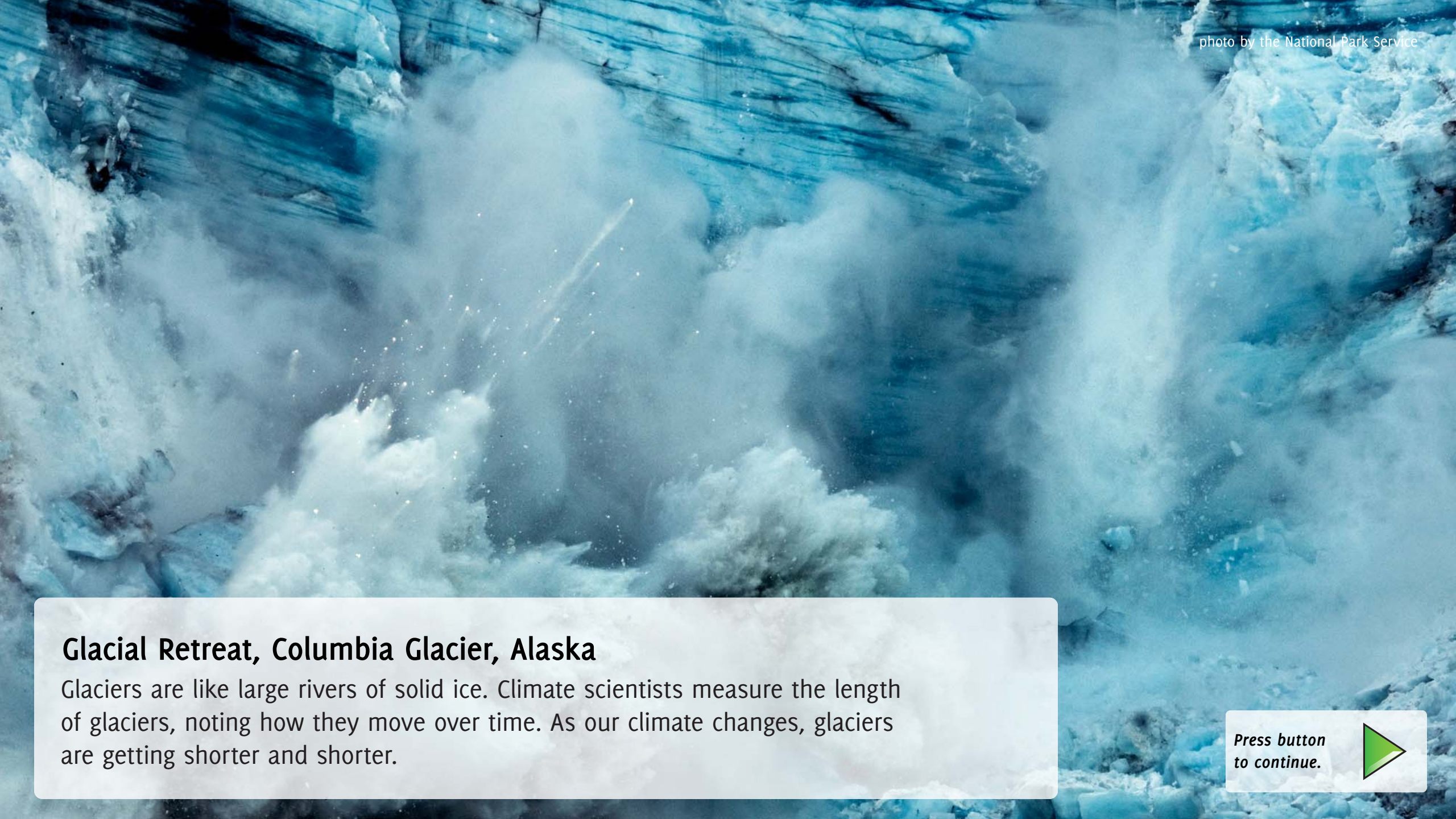


photo by the National Park Service

Glacial Retreat, Columbia Glacier, Alaska

Glaciers are like large rivers of solid ice. Climate scientists measure the length of glaciers, noting how they move over time. As our climate changes, glaciers are getting shorter and shorter.

Press button to continue.

Compare these two images.

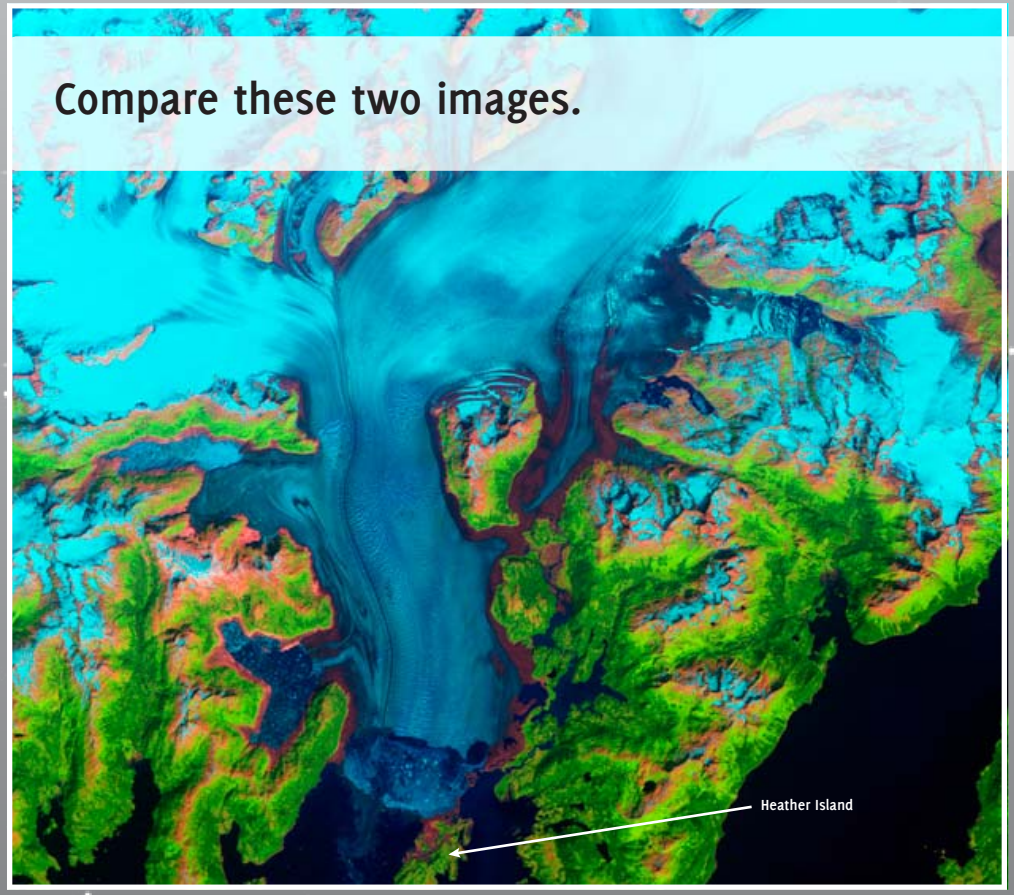


Image 1: Columbia Glacier 1986
In this shortwave infrared Landsat image, snow and ice appear light blue and turquoise. The glacier has long lines in it, like a flowing liquid. At the terminus, or end, of the glacier, there is a clear edge where the ice meets dark blue liquid water. In 1986, the terminus was just north of Heather Island.

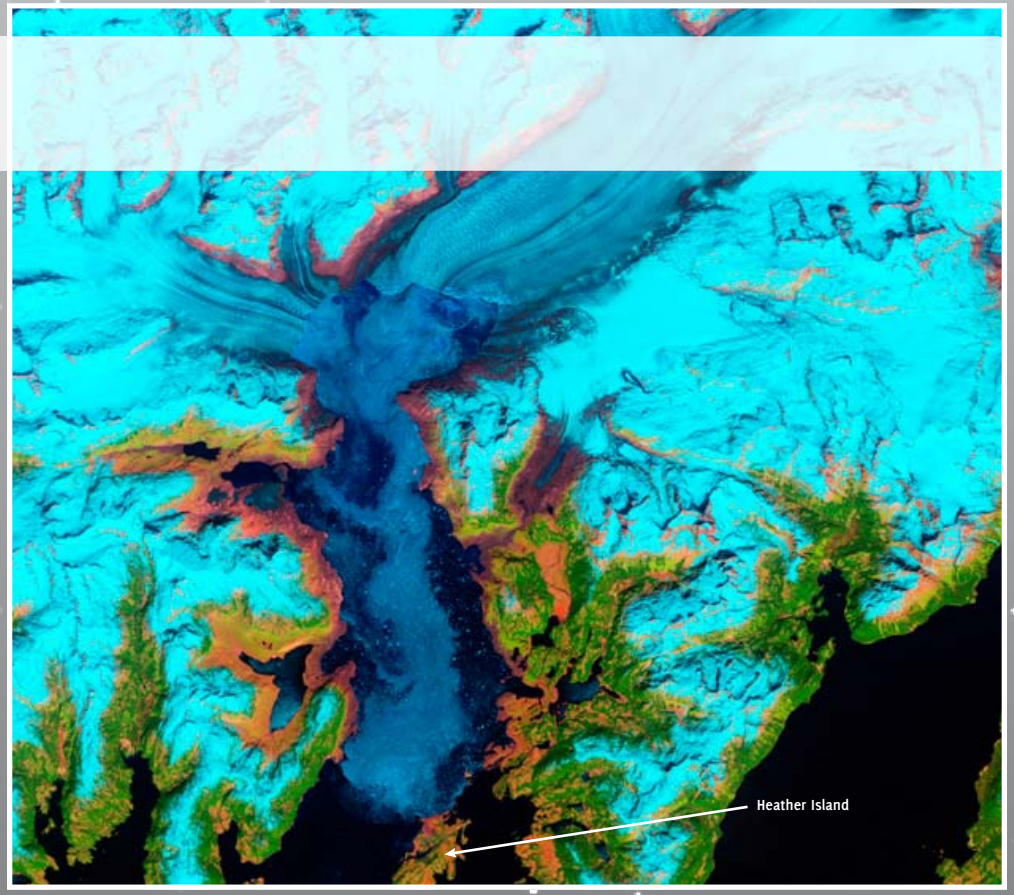


Image 2: Columbia Glacier 2011
When ice breaks off the end of a glacier, some of the fallen ice floats on the water. In this shortwave infrared Landsat image from 2011, much of the pale blue color north of the island is floating ice. It looks swirly, like turquoise paint being stirred into dark blue paint, compared to the long, steady lines of the glacier.

Can you find the new terminus of the Columbia Glacier in the 2011 image?

Press button to continue.

By 2011, the glacier had retreated more than 12 miles north. In fact, it split into two glaciers! Ice that falls off glaciers eventually melts, adding more water to the ocean. Climate scientists measure glaciers in order to predict how much sea levels will change—important information for people who live in coastal cities and on islands.

Select another location on the map below.

Flood Response Near Khewali, Pakistan

Floods threaten food and water supplies, homes, farms, businesses, and people's lives. Aid agencies bring help to people in need, and they want to target the areas that need assistance the most. Landsat images can show exactly where floods are happening.

Press button to continue.

Compare these two images.

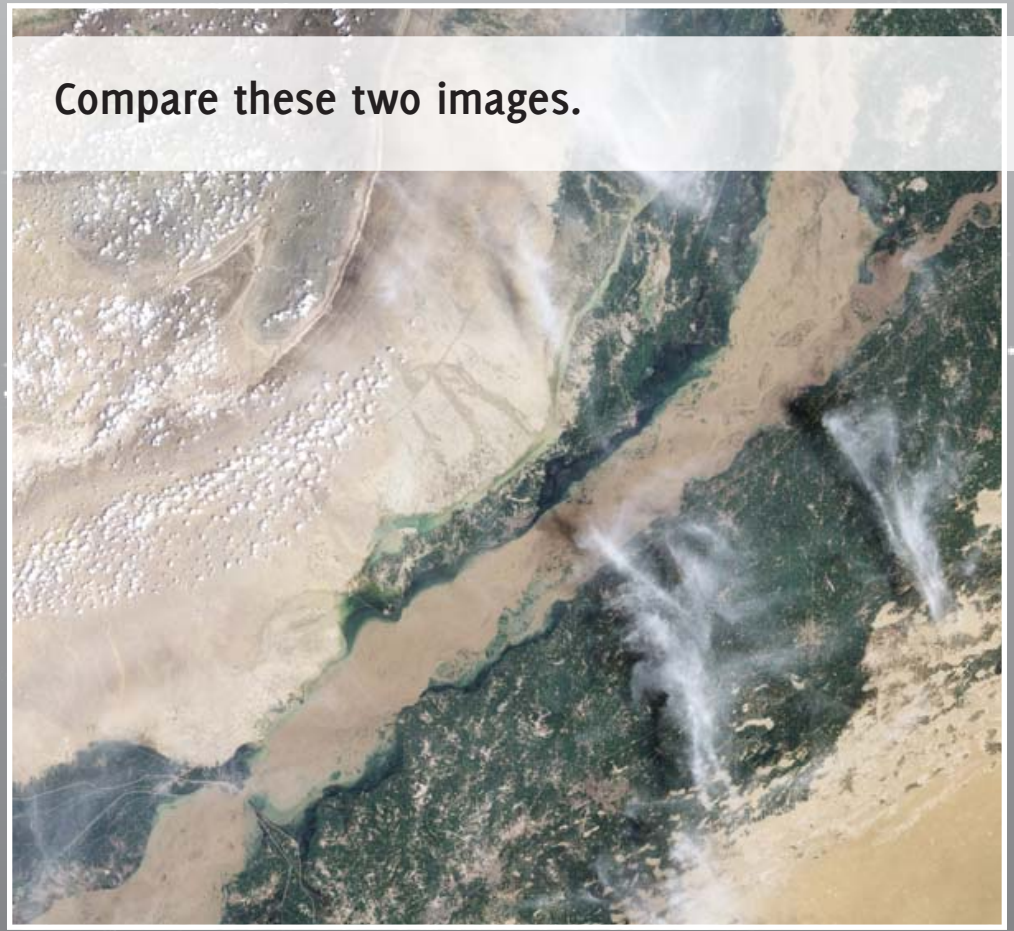


Image 1: The Indus River, like we see it
In August of 2012, the Indus River flooded many communities in Pakistan. Floodwaters are a murky tan in this Landsat image, which was made with visible light. Plant cover is green, and bare ground and sand also appear tan.

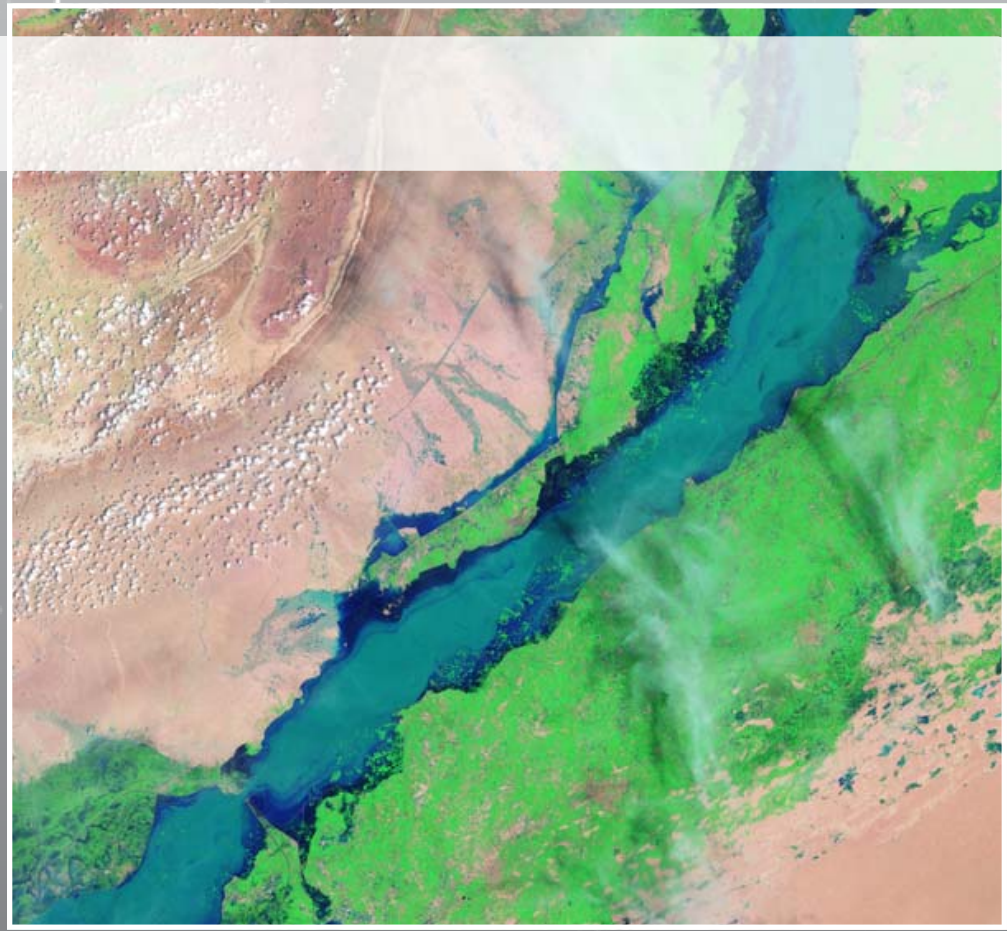
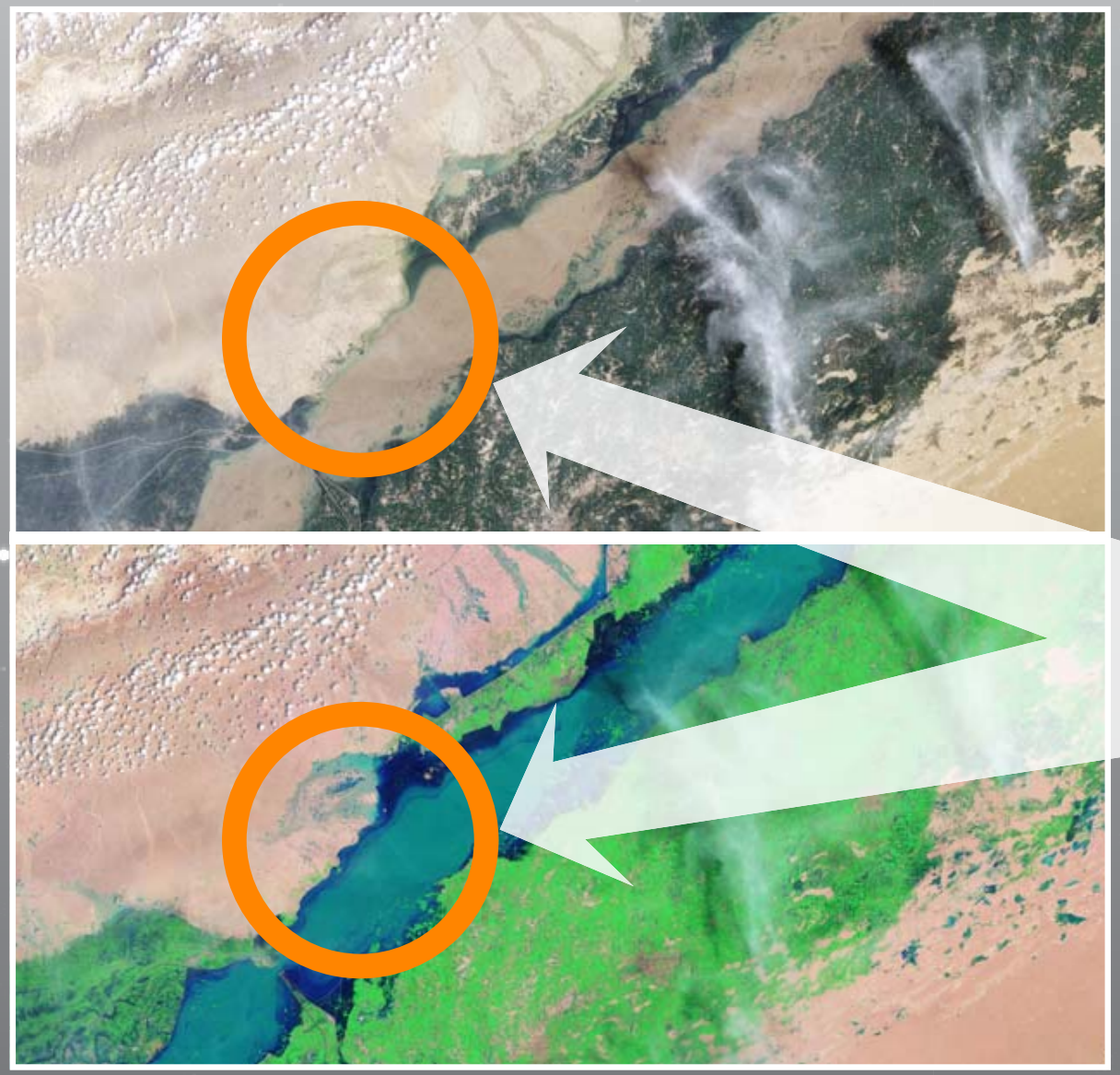


Image 2: The Indus River, in shortwave infrared
This Landsat image was made with infrared and visible light. Water is shown in black or blue here. Plant-covered land is bright green, and bare ground is tan.

If you were planning where to deliver emergency supplies, which image would you use to see the extent of the flood?

Press button to continue.



In the natural color Landsat image, the bare ground and the floodwaters both look tan. In the infrared Landsat image, it's much easier to distinguish between the blue floodwater and the tan ground. This helps aid agencies plan where to send help.

Select another location on the map below.